in Fig. 8 of our paper, the calculated particle mean velocities based on our model are equal to the fluid ones. As mentioned above, the perturbation parameter  $\epsilon$  of Davidson the McComb is smaller than 0.05 in these regions. Hence the result that particle mean velocity  $U_p$  and fluid mean velocity  $U_f$  are nearly equal in these regions is also obtained by using the theory of David-

son and McComb. As already mentioned, the lag between particle and fluid increase with the increasing frequency of fluid motion due to particle inertia. Hence the result that  $U_p = U_f$  and  $D_p < D_f$  is reasonable. We have already pointed out in our paper (around Eq. (22)) that the experimental particle diffusivity in the region  $U_p \neq U_f$  cannot be obtained by using the Eulerian

method based on experimental results of particle concentrations if we do not get particle mean velocity.

Literature cited is the same as the McComb and Davidson letter.

SHINICHI YUU Kyushu Institute of Technology Tobata, Kitakyushu 804 Japan

# INDEX TO VOLUME 26 Authors

		Autilois			
A		D		Hanks, Richard W	152
		D	. Fo	Harriott, G. M.	398
Abramzon, Boris	536	Danner, Roland P		Harris, T. J.	910
Albrecht, J. J.	496	Darby, Ron	310	Hauser, G. M.	743
Altiner, H. Kubilay	297	Daubert, Thomas E	386	Hegedus, L. L.	935
Amundson, Neal R		Davis, H. T		Heidemann, Robert A	769
Anderson, John L	817	DeGance, Anthony E	411	Hekim, Yusuf	403
Andrew, J.	944	Degnan, Thomas F.	60 292	Henry, J. D., Jr.	83
Arashmid, M	51	Denn, Morton M	305	Herzog, Peter M	567
Aris, Rutherford	529		1029	Heyt, John W.	762
Arkun, Yaman 220,		Dhanuka, V. R. Dixon, D. Christopher	471	Hidalgo S., R.	585
Atappan, R	517	Djordjević, Boran D.	858	Hill, Frank B	390
В			1020	Hill, James C	678
		Dogu, G	287	Himmelblau, D. M	168
Bailey, James E	319	Doraiswamy, L. K.	635	Hinduja, M. J.	274
Balaraman, K. S	635	Dudukovic, Aleksandar P.	299	Ho, C. P	680
Barot, Devendra T	289	Dukler, A. E.	345	Hofmann, H	794
Basmadjian, Diran	625	Dukier, A. E.	340	Holste, J. C.	954
Bellomy, M. T	954	E		Hom, J. F	872
Bennett, Douglas L	454	Eckert, Roger E	751	Huang, D. TJ.	832
Berg, Lloyd	862	Elbirli, B.	865	Hwang, Sun-Tak	558
Berna, T. J.	37	Epstein, Michael	743	Hyun, Jae Chun	294
Bethea, Robert M	321	Essoh, Djedjess C.	869		
Bhatia, S. K.	379	Eubank, P. T.	954	Viscon V	690
Bhirud, V. L.	902	Evans, D. F.	313	Iinoya, K.	680
Biceroglu, O	734	Evans, D. F	313	Im, Kwan H	655 507
Bilimoria, Maheyar R	319	F		Ishikawa, Takeshi	372
Bittman, Gilbert V	295	Fan, L. T	139	Isiiikawa, Takesiii	312
Borde, Irene	536	Fan, Liang-Shih	139	I I	
Bornea, Dvora	345	Faith, D. C. III	916	Jackson, R	274
Breedveld, G. J. F.	462	Fiedler, K.	510	Jeffreys, G. V.	51
Brewster, Brandon S	325	Figuiere, P.	872	Johns, Lewis E	411
Broderick, D. H.	690	Fischer, J.	794		
Brown, Lee F.	355	Fitzmorris, R. E.	265	К	
Bruns, Duane D	319	Flower, John R.	1	Kalogerakis, Nicolas	670
Bulow, M	1044	Flumerfelt, R. W	430	Karger, J.	1044
C		Fogler, H. S.	403	Kavasamaneck, Percy R	134
		Fonteix, C.	282	Keairns, D. L.	144
Carberry, J. J	832	Fraenkel, D	690	Kershenbaum, L. S	496
Carey, B. S	705	Friedlander, Sheldon K	593	Kessler, David P.	308
Caro, J.	1044	Furzer, I. A.	663	Khalil, Ahmed M	769
Cavendish, J. C.	935			Kieckbusch, Theo G.	718
Chan, Yau Nam I.	390	G		King, C. J.	718
Charpentier, J. C157	282	Gates, B. C	690	Kleinman, A. M.	828
Chartier, P. A.	672	Gauvin, W. H.	734	Klinzing, George E.	369
Chaudhari, R. V.	177	Gavalas, George R201,	577	Knepper, Jay C.	260
Chen, H. T	839	Gelbin, D	510	Kobayashi, Riki	616 862
Chen, John C	544	Geopp, John W	855	Kober, P. J.	299
Chen, Te-Yu	24	Gomez, M., A	585	Končar-Djurdjevic, Slobodan K	567
Chevray, Rene	390	Gordon, R. J.	852	Krieger, Barbara B. Kaun, C. N.	672
Chhabra, R. P.	522	Gorman, John W	260	Kauli, G. N	012
Chiou, C. S.	852	Goss, D. W	663	L	
Chung, Paul M.	655	Gough, D. A	1013	Lambert, G. A.	743
Chung, W. K.	372	Gradon, L	443	Lauguer, S.	872
Churchill, Stuart W.	855	Greenkorn, Robert A	308	Laurent, A	
Clements, L. D314		Grevillot, Georges	120	Lazalde-Crabtree, H	462
Correa V., A.	585	Gupta, Jai P.	991	Lee, Hong H	148
Coughlin, Robert W	865	н		Lee, Lap-Keung	16
Crump, James G	610		0.54		1008
Cummings, D. L	1041 43	Hall, K. R	954 355	Lehrer, Isaac H	170 881

Accumulati Fiber Adsorption tures Dioxi Near. and 1 Pertu Aerosol B Stirre Analysis of On A Analysis of Lean Analysis of terist sions Applicatio Finite One-Inclu Applicatio Princ Diffu Approxima sion ( Medi Approxima Lévê vanci Axial Disp tions Axial Velo Symi Binary Di Calculatio Calculatio Equa tion Calculatio for a Equ Con Channel 1 Mov Chlorinat RF ( Cluster D

> Co-curre The. Combine Con coel Compreh Coa Concentr Coe Conjugat a D Construc tion tive Continuo Correlat Lan tion Flui

AICHE

# **Titles**

A Accumulation of Solid Particles on Single		Correlation Between Tracer Diffusivity, Solvent Viscosity, and Solute Sizes	313	Experimental and Analytical Study of Wall Reaction and Transport Effects	
Fibers Exposed to Aerosol Flows	289	Correlation for Laminar Free Convection Over the Entire Range of Prandtl		in Fast Reaction Systems Extended Graetz Problem with Pre-	567
Adsorption of Methane and Several Mix-		Numbers, A	850	scribed Wall Flux, The	779
tures of Methane and Carbon Dioxide at Elevated Pressures and		Correlation of Second Virial Coefficients			
Near Ambient Temperatures on 5A		of Polar Gases by Redlich-Kwong		F	
and 13X Molecular Sieves by Tracer		Equation of State	858	Facilitated Transport of Carbon Mon-	
Perturbation Chromatography	616	Corresponding States Equation for Satu-		oxide Through Cuprous Chloride	
Aerosol Behavior in the Continuous	010	rated Liquid Densities, A, Parts I-II		Solutions, The	112
Stirred Tank Reactor	610		337	Fluid Pressure Distribution in an Aer-	
Analysis of Draw Resonance by Hyun,		Critical Reynolds Numbers for Newto-	1 110	ated Hopper	297
On An	292	nian Flow in Concentric Annuli .	152	Forced Convective Boiling in Vertical	
Analysis of Drop Size Distributions in		Critical Velocity in Pipeline Flow of Slur-	==0	Tubes for Saturated Pure Compo-	
Lean Liquid-Liquid Dispersions .	991	ries, The	550	nents and Binary Mixtures	454
Analysis of the Phase Inversion Charac-		Bed Reactors, A	274	Fundamental Investigations and Elec-	
teristics of Liquid-Liquid Disper-		Cubic Perturbed Hard Sphere Equation	417	trochemical Engineering Aspects	
sions	51	of State for Thermodynamic Proper-		Concerning an Advanced Concept	
Application of a Variable Time-Step		ties and Vapor-Liquid Equilibrium		for Alkaline Water Electrolysis	794
Finite-Difference Method for the		Calculations, A	372	G	
One-Dimensional Melting Problem	020	D		G	
Including the Effect of Subcooling	828	D 1 D (1 1 1		Gas-Absorbate Collisional Effects and	
Application of Corresponding States Principles for Prediction of Self-	*	Dendritic Deposition of Aerosols by		Surface Diffusion in Porous Mate-	
Diffusion Coefficients in Liquids .	386	Convective Brownian Diffusion for		rials	355
Approximate Formulae for the Disper-	000	Small, Intermediate and High Par-	443	Gas Absorption with Consecutive	000
sion Coefficients of Layered Porous		ticle Knudsen Numbers  Determination of Diffusion Properties of	440	Second-Order Reactions	832
Media	513	Impervious Layer of a Double		Gas Adsorption Isotherm Equation	
Approximate Solution for the Graetz and		Layered Catalyst Pellet	148	Based on Vacancy Solution Theory,	68
Lévêque Problems from the Ad-		Determination of Interaction Second		Gas Phase Ozonation of Aliphatic Sulfur	UC
vancing Front Theory, An	136	Viral Coefficients; He-CO <sub>2</sub> System	954	Compounds	321
Axial Dispersion Through Tube Constric-		Diffusion Coefficients for Helium, Hy-		Gas Pressure Drop in Concurrent Flow	02.
tions	9	drogen, and Carbon Dioxide in		With Pseudoplastic Films	151
Axial Velocity of a Submerged Axially	1000	Water at 25°C	154	General Criterion to Test the Importance	
Symmetrical Fluid Jet, The	1038	Digital Control of Time-Delay Processes	295	of Diffusion Limitations in Bidis-	
В		Dynamic Liquid Holdup in Two-Phase		perse Porous Catalysts, A	287
Binary Diffusion in Liquid Systems	1046	Downflow in Packed Beds: Air- Silicone Oil System	317	tr.	
	1010	Dynamics of Bubbles and Entrained Par-	011	n	
C		ticles in the Rotating Fluidized Bed	390	Heat and Mass Diffusion with Chemical	
Calculation of Critical Points, The	769	Dynamics of Mixed Cultures of Mi-		Reaction: A Moving Boundary	0.00
Calculation of Density by the BWRS		croorganisms: Some Topological		Analysis in a Particle	869
Equation of State in Process Simula-		Considerations	802	Heat Transfer from Two-Phase Boundary Layers on Isothermal Cylinder:	
tion Contexts, The	902			Influence of Drop Trajectory	762
Calculation of the Governing Equations		E		High Gradient Magnetic Separation in a	102
for a Seriated Unequal Velocity,		Effect of an Array of Objects on Mass		Viscous Flow Field	1041
Equal Temperature Two-Phase	90	Transfer Rates to the Tube Wall: An	200	Hindered Settling of a Suspension at Low	
Channel Flow Analysis for Borous Rada	89	Additional Note Effect of an Expanded Section on Slug-	299	Reynolds Number	816
Channel Flow Analysis for Porous Beds Moving Under High G. Forces, A	363	ging, The	144	Hydrodynamic Effect of Surfactants on	
Chlorination Kinetics of Zirconia in an	000	Effect of Data Length on the Region of	AAA	Gas-Liquid Oxygen Transfer	1008
RF Chlorine Plasma Tail Flame .	734	Convergence in Parameter Estima-		Hydrodesulfurization of Benzo (b)	
Cluster Diffusion in Liquids	43	tion Using Quasilinearization	670	Naphtho (2,3-d) Thiophene	
Co-current Reactor-Heat Exchanger,		Effect of Sludge Funneling in Gravity		Catalyzed by Sulfided CoO-	
The, Part II	60	Thickeners	471	MoO <sub>3</sub> /Y-AI <sub>2</sub> O <sub>3</sub> : The Reaction Net-	cov
Combined Laminar Forced and Free		Effectiveness and Deactivation of a Di-		work	690
Convection Heat Transfer to Vis-		luted Catalyst Pellet	55	Hyperboloidal Constricted Tube Model of Porous Media, A	694
coelastic Fluids	683	Electrically Stimulated Aerosol Filtra-		of Porous Media, A	031
Comprehensive Model for Fluidized Bed	0.40	tion in Packed Beds	398	I	
Coal Combustors, A	642	Empirical Model of Velocity Profiles for		II we was all the Makes with	
Concentration Dependence of Diffusion	F10	Turbulent Flow in Smooth Pipes,	200	Identification and Linear Multivariable Control in an Absorption-De-	
Coefficients in Zeolites, On the Conjugate Unsteady Heat Transfer From	510	An Emulsion Phase Residence Time and Its	308	sorption Pilot Plant	490
a Droplet in Creeping Flow	536	Use in Heat Transfer Models in		Improving Distillation Column Design	20
Construction of Dispersion Approxima-	330	Fluidized Beds	544	Using Thermodynamic Availability	
tions to the Solution of the Convec-		Equilibrium Staged Parametric Pump-		Analysis	26
tive Diffusion Equation, On the .	411	ing, Part III	120	Influence of Condensable Vapor on	
Continuous Membrane Column, The	558	Error in the Propagation of Error For-		Strength of Powders	86
Correlating Equation for Combined		mula	168	Influence of Mixing on the Antisolvent	
Laminar Forced and Free Convec-		Exact Solution of a Model for Diffusion in		Induced Agglomeration and	
tion Heat Transfer to Power-Law		Particles and Longitudinal Disper-		Sedimentation of Mineral Matter in	
Fluids, A	505	sion in Packed Beds	686	Coal Derived Liquids, The	8

Pyrolysis						1
tion of Inertialess Particles on a Single Sphere and in a Granular Bold Single Sphere and in a Granular Bold Single Sphere and in a Granular Bold Single Sphere and Single Sphere and Single Sphere and Single Sphere and Spropsing Modeling of Castylated Sphere Southern Southons Survey Flore Sudden Street Amosphere Southern South Sphere and Adorption in Liquid Full and Trickle Beld Markenatical Modeling of Castylated Street Studies Converte Lightiff. Single-Fellet Studies Character Studies Converte Lightiff Single-Fellet Studies Character Studies Cha	Interceptional and Gravitational Deposi-		0		Sorption Kinetics of n-Decane on SA	
Single Sphere and in a Granular Bed of Sphere and in a Granular Bed of the Internitial Mass Transfer in Coal Intraparticle Mass Transfer in Coal Coal Explainment of Cydobexano of No-Adsorptive Reactors, An Order of Parallel Dehydrogenation and Dehydration of Cydobexano of Nico Ado, Catalyst Systems of Interinked. Multisaged Systems of Parallel Dehydrogenation and Dehydration of Physical Mass Transfer Parameters in Mechanically Aghtated Gas Liquial Reactors, ow Shear Viscosity of Dilute Polymers Southons of Systems of Interinked Multisaged Systems of Inter						
Bed Mars Transfer in Coal Proysis — Seminary Theory of Adorphic Reactors. An Adorphic Reactors of Proysis — Seminary Theory of Adorphic Reactors. An Adorphic Reactors of Proysis — Seminary of Adorphic Reactors of Proysis — Seminary of Adorphic Reactors of Proysis — Seminary of Properties of Seminary of Proposition in Liquid Fell and Trickle Beds — Seminary of Proposition of Proysis — Seminary of Properties of Seminary of Properties of Seminary of Properties of Systems — Proposed Fell and Proposition of Proposed Pathway of Properties of Seminary of Proposed Pathway of Proposition of Proposed Pathway of Proposed Polymerization in According With a Non-linear Exponential Filter — Seating of Consultations White Pathway of Pathway of Proposition of Proposed Pathway of Prop						1044
ntraparticle Mass Transfer in Coal Probysis of Canglion Dynamics During Immiss Probysis of Canglion Dynamics During Immiss and Congress of Constrained Data Steech States of Non-Lothermal Sorption in Molecular Sieve Crystals 15 (Insertics of Non-Lothermal Sorption in Molecular Sieve Crystals 201 (Insertical Equations for Cornel States of Part of Congress of Confederation of Cyclobecaused on Non-Cody Calculary 6 Systems 15 (Insertical Equations for Cornel States of Part of Confederation of Cyclobecaused on Non-Cody Calculary 6 Systems 15 (Insertical Congress of States of Confederation of Cyclobecaused on Non-Cody Calculary 6 Systems 15 (Insertical Congress of States of Confederation of Cyclobecaused on Non-Cody Calculary 6 Systems 15 (Insertical Congress of States of Confederation of Cyclobecaused on Non-Cody Calculary 6 Systems 15 (Insertical Congress of States of Confederation of Cyclobecaused on Non-Cody Calculary 6 Systems 15 (Insertical Congress of States of Confederation of Cyclobecaused on Non-Cody Calculary 6 Systems 15 (Insertical Congress of States of Confederation of Cyclobecaused on Non-Cody Calculary 6 Systems 15 (Insertical Congress of Systems 15 (Insertical Congress of States of Confederation of Cyclobecaused Option of Cy		698		E00		
Fyrolysis introduction to the Nonlinear Theory of Adsorptive Reactors, An	Intraparticle Mass Transfer in Coal			529	talizer with Size-Dependent	
Assorptive Reactors, An official method in the Molticular Sieve Crystals (Sincetics of Paullo Debytorogenation and Debydration of Cyclohexanol on Molecular Sieve Crystals (Sincetics of Paullo Debytorogenation and Debydration of Cyclohexanol on Molecular Sieve Crystals (Sincetics of Paullo Debytorogenation and Debydration of Cyclohexanol on Molecular Sieve Crystals (Sincetics of Paullo Debytorogenation and Debydration of Cyclohexanol on Molecular Sieve Crystals (Sincetics of Paullo Debytorogenation and Debydration of Cyclohexanol on Molecular Sieve Crystals (Sincetics of Paullo Debytorogenation and Debydration of Cyclohexanol on Molecular Sieve Crystals (Sincetics of Paullo Debytorogenation and Debydration of Cyclohexanol on Molecular Sieve Crystals (Sincetics of Paullo Sieve Crystals (Sincetics of Carbon Paullo Sieve Crystals (Sincetics of Paullo Sieve Crystals (Sincetics of Paullo Sieve Crystals (Sincetics of Paullo		201			Growth Rate	507
Set				400	Statistical Analysis of Constrained Data	-01
Kinnets of Non-Lothermal Surption in Makevains Sieve Crystale (Linearized Equations for General Stephantons and Dehydration of Cyclohexanol on NiO-Al <sub>2</sub> O Catalyst Systems of 157.  Limits of the Chemical Method for the Determination of Physical Mass Cally Agitated Gas-Lajudi Reactors Cowserver Lives of Dilute Polymer Solutions Mass Transfer and Astorption in Liquid Full and Triville Biol.  Mass Transfer and Astorption in Liquid Full and Triville Biol.  Mass Transfer and Astorption in Liquid Full and Triville Biol.  Mass Transfer in Periodically Cycled Flate Columns Containing Multiple Steve Plates of Turbulent Flow velocity for Sudden Expansion Cylindrical Turbulent Flow Velocity for Sudden Expansion Cylindric Turbulent Flow Velocity for Sudd		477		430	,	260
Sinetics of Non-Isothermal Sorption in Molecular Sieve Crystals				104		
Sinetics of Parallel Dehydrogenation and Dehydration of Cyclohecand on NiCo-Alo, Catalyst Systems  L	K			134		
Molecular Sieve Crystals (162) interest of Parallel Dehydrogenation and Dehydration of Cyclohexanol on NOc-Alop Catalyst Systems (152) interest of Parallel Dehydrogenation and Dehydration of Cyclohexanol on Noc-Alop Catalyst Systems (152) interest of Parallel Dehydrogenation of Physical Mass Transfer Parameters in Meaning Mulpile Studies (152) interest (152) inter	Kinetics of Non-Isothermal Sorption in				Coefficient in Three-Phase	
Sincetics of Parallel Dehydrogenation and Dehydration of Cyclobecanion of Oxyclobecanion of Physical Mass Transfer Parameters in Mechanically Agitated Gas-Liquid Reads as Transfer Parameters in Mechanically Agitated Gas-Liquid Reads as Transfer and Adsorption in Liquid Full and Tricke Both Mathematical Modeling of Catalytic Converter Lightoff: Single-Petlet Studies  Singles Transfer in Periodically Cycled Plate Columbus Containing Multiple Reads and States in Periodically Cycled Series Plates Columbus Containing Multiple Reads and States in Periodically Cycled Series Plates Columbus Containing Multiple Reads and States in Periodically Cycled Plate Columbus Containing Multiple Reads and States in Periodically Cycled Series Plates Columbus Containing Systems  String-I and Plate Columbus Containing Systems String-I and Plate Columbus Containing Systems  String-I and Plate Columbus Containing Systems String-I and Plate Columbus Containing Systems  String-I and Plate Columbus Containing Systems  Systems String-I and Plate Columbus Containing Systems  Systems String-I and Plate Columbus Containing Systems  Systems String-I and Plate Columbus Containing Systems  Systems String-I and Plate Columbus Containing Systems  Systems String-I and Plate Columbus Containing Systems  Systems String-I and Plate Columbus Containing Systems  Systems String-I and Plate Columbus Containing Systems  Systems String-I and Plate Columbus Containing Systems  Systems String-I and Plate Columbus Containing Systems  Systems String-I and Plate Columbus Containing Systems  Systems String-I and Plate Columbus Containing Systems  Systems String-I and Plate Columbus Containing Systems  Systems String-I and Plate Columbus Containing Systems  Systems String-I and Plate Columbus Containing Systems  Systems String-I and Plate Columbus Containing Systems  Systems String-I and Plate Columbus Containing Systems  Systems String-I a		16			Fluidized Beds	1029
Dehydration of Cyclohexanol on NiO-Alo, Catalyst Systems 517  Limits of the Chemical Method for the Determination of Physical Mass cally Agitated Gas-Liquid Reactors cows hear Viscosity of Dilute Polymer Solutions M M  Mass Transfer and Adsorption in Liquid Full and Trickle Beds Modeling of Catalytic Converter Lightoff: Single-Pellet Mass Transfer and Adsorption in Liquid Full and Trickle Beds Modeling of Catalytic Converter Lightoff: Single-Pellet Mass Transfer and Adsorption in Liquid Full and Trickle Beds Modeling of Catalytic Converter Lightoff: Single-Pellet Mass Transfer in Periodical Pock Saisted Heterogeneous Catalysis with Optical Fibers 111. Nonisothermal Single Fiber and Fiber Boundle Polymer Stiver Plates Measurement Snoothing With a Nonlinear Exponential Fiber 112. Nonisothermal Single Fiber and Fiber Boundle Polymer Plant of Turbulent Flow Velocity for Sudden Expansion Cylindre and Turbulent Flow Velocity for Sudden Expansion Cylindre Conference on State Systems 112. Modeling Flow Fattern Transitions for Steady Upward Gas-Liquid Flow in Vertical Tubes 112. Modeling Flow Fattern Transitions for Steady Upward Gas-Liquid Flow in Vertical Tubes 112. Modeling Flow Fattern Transitions for Steady Upward Gas-Liquid Flow in Vertical Tubes 112. Modeling Flow Fattern Transitions for Steady Upward Gas-Liquid Flow in Vertical Tubes 112. Modeling Flow Flow Flow Flow Flow Flow Flow Flow				FOF	Stochastic Simulation of the Motion,	
Solutions of Physical Mass cally digitated Gas-liquid Research Solutions of Physical Mass cally digitated Gas-liquid Research Solutions (Casting Media Durin; Intensition of Physical Mass Cally Agitated Gas-liquid Research Solutions (Casting Media Durin; Intensition of Physical Mass Transfer and Adsorption in Liquid Fall and Triolde Beds 14 Mass Transfer and Adsorption in Liquid Fall and Triolde Beds 14 Mass Transfer and Adsorption in Liquid Fall and Triolde Beds 14 Mass Transfer and Adsorption in Liquid Fall and Triolde Beds 14 Mass Transfer and Adsorption in Liquid Fall and Triolde Beds 14 Mass Transfer in Periodically Cycled Plate Columns Containing Multiple Sales Plate Columns Containing Multiple Research Mass Transfer in Periodically Cycled Plate Columns Containing Multiple Research Transfer in Periodically Cycled Plate Columns Containing Multiple Research Transitions for New Plate Columns Containing Systems 15 Mass Transfer in Periodically Cycled Plate Columns Containing Multiple Research Transitions for New Plate Columns Containing Systems 15 Mass Transfer in Periodically Cycled Plate Columns Containing Multiple Research Transitions for New Plate Columns Containing Multiple Research Transitions for New Plate Columns Columns (New Plate Columns (				585	Breakup and Stranding of Oil Gang-	
Limits of the Chemical Method for the Determination of Physical Mass Transfer Farameters in Mechanically Aghtated Cas-Liquid Reaction Solutions Solutions Solutions M Modeling of Catalytic Converter Lightoff: Single-Pellet Studies.  Mass Transfer and Adsorption in Liquid Full and Trickle Beds Mass Transfer and Adsorption in Liquid Full and Trickle Beds Mass Transfer and Adsorption in Liquid Full and Trickle Beds Mass Transfer and Adsorption in Liquid Full and Trickle Beds Mass Transfer and Adsorption in Liquid Full and Trickle Beds Mass Transfer and Adsorption in Liquid Full and Trickle Beds Mass Transfer and Adsorption in Liquid Full and Trickle Beds Mass Transfer and Adsorption in Liquid Full and Trickle Beds Mass Transfer and Adsorption in Liquid Full and Trickle Beds Mass Transfer and Adsorption in Liquid Full and Trickle Beds Mass Transfer and Adsorption in Liquid Full and Trickle Beds Mass Transfer Advanced Method English of Mass Mathematical Modeling of Catalytic Converter Lightoff: Single-Pellet Switch Studies and Trickle Beds Mass Transfer Transfer Modeling Flow Fatters Transitions for Steady Upward Gas-Liquid Flow in Vertical Tubes Mass Mass Transfer Tran		517				
imits of the Chemical Method for the Determination of Physical Mass Transfer Parameters in Mechanic ally Agitated Gas-Liquid Reactors Shear Viscousty of Diulue Physical Mass Transfer and Adsorption in Liquid Full and Trickle Beds Mass Transfer and Adsorption in Liquid Full and Trickle Beds Mass Transfer in Periodically Cycled Plate Columns Containing Multiple Sieve Plates of Property Velocity for Sudden Expansion Cylindric all Tube Using Laser Doppler Velocity for Sudden Expansion Cylindric all Tube Using Laser Doppler Velocity for Sudden Expansion Cylindric all Tube Using Laser Doppler Velocity for Sudden Expansion Cylindric all Tube Using Laser Doppler Velocity for Sudden Expansion Cylindric all Tube Using Laser Doppler Velocity for Sudden Expansion Cylindric all Tube Using Laser Doppler Velocity for Sudden Expansion Cylindric all Tube Using Laser Doppler Velocity for Sudden Expansion Cylindric all Tube Using Laser Doppler Velocity for Sudden Expansion Cylindric all Tube Using Laser Doppler Velocity for Sudden Expansion Cylindric all Tube Using Mixture Columns of Stephen Mass Transfer in Periodical Plate National Containing Systems Makes and Cincetter of Columns of Stephen Mass Transfer in Periodic Stephen Mass Transfer in Periodical Plate National Containing Systems Makes and Cincetter of Columns of Stephen Mass Transfer in Periodical Plate National Containing Systems Sudden Expansion Cylindric all Tube Using Mixture Columns of Stephen Mass Transfer in Periodic Stephen Mass Transfer Pulming Mass Transfer Pulming Mass Transfer Pulming Mass Transfer Pulming Mass Transfer Pulmi				010		
Limits of the Chemical Method for the Determination of Physical Mass Transfer Parameters in Mechanically Agitated Gas-Liquid Beach State Gas-Liquid Method Isos (Gas-Liquid Me	L		actor	910		419
Determination of Physical Mass Transfer parameters in Mechanically Agitated Gas-Liquid Reactors cows hear Viscosity of Dulute Polymer Solutions  M  Mass Transfer and Adsorption in Liquid Pland Trickle Beds and Meland Trickle Beds and Mass Transfer in Periodically Cycled Plate Columns Containing Multiple Sieve Plates  Mass Transfer Detroidically Cycled Plate Columns Containing Multiple Sieve Plates  Measurement Smoothing With a Nonlinear Exponential Filter  Measurement Smoothing With a Nonlinear Exponential Filter  Measurement Smoothing With a Nonlinear Exponential Filter  Measurement Sonothing With a Nonlinear Exponential Filter  Measurement Sonothing Multiple Systems  Messurement Sonothing Multiple Systems  Modelling Flow Pattern Transitions for Steady Upward Gas-Liquid Flow in Procus Media, On the Morion Bed Solids Flow in an Inclined Floye Local Multiple Reaction Zones in Procus Media, On the Morion Bed Solids Flow in an Inclined Floye Local Multiple Reaction Zones in Procus Media, On the Morion Bed Solids Flow in an Inclined Floye Local Multiple Reaction Zones in Procus Media, On the Morion Bed Solids Flow in an Inclined Floye Local Multiple Reaction Zones in Procus Media, On the Morion Bed Solids Flow in an Inclined Floye Local Multiple Reaction Zones in Procus Media, On the Morion Bed Solids Flow in an Inclined Floye Local Multiple Reaction Zones in Procus Media, On the Morion Bed Solids Flow in an Inclined Floye Local Multiple Reaction Zones in Procus Media, On the Morion Beds Solids Flow in an Inclined Floye Local Multiple Reaction Zones in Procus Media, On the Morion Beds Solids Flow in an Inclined Floye Local Multiple Reaction Zones in Procus Media, On the Morion Beds Solids Flow in an Inclined Floye Local Multiple Reaction Zones in Procus Media, On the Morion Beds Solids Flow in an Inclined Floye Local Multiple Reaction Zones in Procus Media, On the Morion Beds Solids Flow in an Inclined Floye Local Multiple Reaction Zones in Procus Media, On the Morion Beds Solids Flow in an	Limits of the Chemical Method for the					
Transfer Parameters in Mechanically Agitated Gas-Liquid Beactors Jow Shear Viscosity of Dilute Polymer Solutions  Mass Transfer and Adsorption in Liquid Exhematical Model diag of Catalytic Converter Lightoff. Single-Pellet Studies  Converter Lightoff. Single-Pellet Studies  Converter Lightoff. Single-Pellet Studies  Converter Lightoff. Single-Pellet Studies  Studies in New State of State Pellet Studies  Studies in New State Plate Solution of Cotalytic Converter Lightoff. Single-Pellet Studies  Studies in New State Plate Solution of Cotalytic Converter Lightoff. Single-Pellet Studies  Studies in New State Process, Parts 19, 111. Nonsiothermal Single Piber and Fiber Bundlet  Plate Columns Containing Multiple Selection of District Plate Studies in Reactor Experiment of String-Institute of Studies in Reactor Experiment of String-Institute with Optional Plate Studies in Reactor Experiment of String-Institute with Optional Plate Studies in Reactor Experiment of String-Institute with Optional String-Institute with Optional Plate Studies in Reactor Experiment of String-Institute with Optional Plate Studies in Reactor Experiment of String-Institute with Optional Plate Studies in Reactor Experiment of String-Institute with Optional Plate Studies in Reactor Experiment of String-Institute with Optional Plate Studies in Reactor Experiment of String-Institute with Optional Plate Studies in Reactor Experiment of String-Institute with Optional Plate Studies in Reactor Experiment of String-Institute with Optional Plate Studies in Activation in an Isothermal Single Plate and Floorism of Chemical Plate Studies in Reactor Experiment of String-Institute with Optional Plate Studies in Activation of Optional Plate Studies Institute with Catalyst Description of Chemical Plate Studies Institu			P			98
cally Agitated Gas-Liquid Reactors So Shear Viscosity of Dilute Polymer Solutions  M  Mass Transfer and Adsorption in Liquid Full and Trické Beds Sudies Sud			Particle Chain Formation in Agreed Fil		Studies in the Synthesis of Control Struc-	
Low Shear Viscosity of Dilute Polymer Solutions (1) Soluti		157		679		
Solutions M  Mass Transfer and Adsorption in Liquid Full and Trickle Beds 11 Mathematical Modeling of Catalytic Converter Lightoff: Single-Pelles Studies 12 Month Containing Multiple serve Plates 12 Month Containing Multiple Systems 12 Modeling Flow Pattern Transitions for Steady Upward Gas-Liquid Flow in Vertical Tube 12 Modeling Flow Pattern Transitions for Steady Upward Gas-Liquid Flow in Portical Tube 12 Modeling Flow Pattern Transitions for Steady Upward Gas-Liquid Flow in Portical Tube 12 Month Containing Multiple Systems 12 Modeling Flow Fattern Transitions for Steady Upward Gas-Liquid Flow in a Retained Flows 12 Modeling Flow Fattern Transitions for Steady Upward Gas-Liquid Flow 12 Month Multiple Rection Zones in a Retriction of Steady Upward Gas-Liquid Flow in a Retriction of Steady Stead Conversion in Entiatained Flows 12 Month Multiple Rection Zones in a Referency Tube 12 Month Multiple Rection Zones in A Restriction and Experiment of Multiple Rection Zones in Amount of Multiple Rection Zones in a Restriction of Steady Stead						220
Mass Transfer and Adsorption in Liquid Pull and Trickle Beds Converter Lightoff: Single-Pellet Studies Converter Lightoff: Single-Pellet Studies Substance of Potential Studies With Optical Pithers: II. Nonisothermal Single Fiber and Fiber Bundle Photopolymerization in a Continuous Stured-Tanak Reactor: Experiment Flow Converter Lightoff: Single-Pellet Studies Substance Studies With Optical Pithers: II. Nonisothermal Single Fiber and Fiber Bundle Photopolymerization in a Continuous Stured-Tanak Reactor: Experiment Flow Studies And Fiber Bundle Photopolymerization in a Continuous Stured-Tanak Reactor: Experiment Predicting Transport Coefficients of Liquids—A United Approach Content of Turbulent Flow Velocity of Studies Expansion Cyloridadical Tube Using Laser Doppler Vel-Misschilly Lumins for Salt Containing Systems Studies (Studies Studies) Studies St		852		100		975
Ass Transfer and Adsorption in Liquid Full and Trickle Beds Mathematical Modeling of Catalytic Converter Lightoff: Single-Fellet Studies Converter Lightoff: Single-Fellet Studies Converter Lightoff: Single-Fellet Converter Lightoff: Single-Fell						
Mass Transfer and Adsorption in Liquid Full and Trickle Beds Courverter Lightoff: Single Pellet Studies  Mass Transfer in Periodically Cycled Plate Columns Containing Multiple Sieve Plates  Measurement Smoothing With a Non-linear Exponential Filter — Measurements of Turbulent Flow Velocity for Sudden Expansion Cylindrical Tube Using Laser Doppler Velocimeter  Measurements of Turbulent Flow Velocimeter for Using Exponential Filter — Measurements of Turbulent Flow Velocimeter for Systems — Miscibility Limits for Salt Containing Systems — Miscibility Limits for Salt Containing Systems — Miscibility Limits for Salt Containing Systems — Modeling Flow Pattern Transitions for Steady Upward Gas-Liquid Flow in Vertical Tubes Modeling Flow Pattern Transitions for Steady Upward Gas-Liquid Flow in Vertical Tubes — Modeling Flow Pattern Transitions for Steady Upward Gas-Liquid Flow in Vertical Tubes — Modeling Flow Pattern Transitions for Beach of Motisper Rectificating Flow Pattern Transitions for Heading Into a Fluidized Bed, Parts I.I.I — Motiplicity and Fluidized Bed, Parts I.I.I — Multiplicity and Fluidized Bed, Parts I.I.I — Multiplicity and Stability of the Hydrogen-Oxygen-Nitrogen Flame: The Longuiston of Hexame in a Refrictions and Equivalence of Optimal Temperature Policies for Reactors with Decaying Catalysts — Separation of Ethylbenzene from p-and m-Xylene by Extractive Distillation Using Mixtures of Polychloro Compounds, The — Security Proposed North Compounds of Hexame in a Refractory Tube — Security Proposed North Compounds of Hexame in a Refractory Tube — Security Proposed Plane: The Combustion of Hexame in a Refractory Tube — Security Proposed North Compounds of Hexame in a Refractory Tube — Security Proposed North Compounds of Hexame in a Refractory Tube — Security Proposed North Compounds of Hexame in a Refractory Tube — Security Proposed North Compounds of Hexame in a Refractory Tube — Security Proposed North Compounds Proposed North Compounds Proposed North Compounds Proposed North Compounds Proposed No	M			901		
Full and Trickle Beds Mathematical Modeling of Catalytic Converter Lightoffic Single-Pellet Studies with Optical Fibers: II Nonisothermal Single Fiber and Fiber Bundle   100	Mass Transfer and Adsorption in Liquid			991		
Mathematical Modeling of Catalytic Converter Lightoff: Single-Pellet Studies  Mass Transfer in Periodically Cycled Plate Columns Containing Multiple Sieve Plates  Measurement Smoothing With a Nonlinear Exponential Filter  Measurement Sonothing With A Nonlinear Exponential Filter  Making Dizease Average Continuous Stirred-Tank Reactor. Experiment Tecletict Exponential Filter Transport Condition in Activation to Charcasification of Definition to Charcasification of Carbon Particles  Beactions, A Part I  Thermodynamics of Transport Through Agueous Solutions, Parts I and II Solution of Optimization of Chemical Parameters for Adsorption of Cog in Beach Solution of Single Bubbles and Drops, A  Thermodynamics of Microemulsions:  Commet Effects of Dipersion of Cog in Beach Solution of Single Bubbles and Drops, A  Thermodynamics of Microemulsions:  Commet Effects of Dipersion of Cog in Beach Solution of Single Bubbles and Drops, A  Thermodynamics of Microemulsions:  Suffer Solut		711				948
Converter Lightoff: Single-Pellet Studies Studies Studies Assar Transfer in Periodically Cycled Plate Columns Containing Multiple Sieve Plates Assarcement Smoothing With a Non- linear Exponential Filter Measurements of Turbulent Flow Velocity for Sudden Expansion Cylindric al Tube Using Laser Doppler Velocities of Turbulent Flow Velocity for Sudden Expansion Cylindric al Tube Using Laser Doppler Velocities Assing of Granular Solids in a Rotary Cylinder Modelling Flow Pattern Transitions for Steady Upward Gas-Liquid Flow in Vertical Tubes Modelling Flow Pattern Transitions for Steady Upward Gas-Liquid Flow in Entrained Flows Modelling Flow Pattern Transitions for Steady Upward Gas-Liquid Flow in Entrained Flows Movement of Multiple Reaction Zones in Entrained Flows Moving-Bed Solids Flow in an Inclined Fige Leading Into a Fluidized Bed, Parts I-II Moving-Bed Solids Flow in an Inclined Fige Leading Into a Fluidized Bed, Parts I-II Multiplicity and Pollutant Formation for the Combustion of Hexane in a Reflatory Tube Multiplicity and Stability of the Hydrogen-Chygen-Nitrogen Flame: The Combustion of Hexane in a Reflatory Tube Multiplicity and Stability of the Hydrogen-Chygen-Nitrogen Flame: The Combustion of Hexane in a Reflatory Tube Multiplicity and Stability of the Hydrogen-Chygen-Nitrogen Flame: The Combustion of Hexane in a Reflatory Tube Moving-Bed Solids Flow in an Inclined Fige Leading Into a Fluidized Bed, Part I-II Multiplicity and Pollutant Formation for the Combustion of Hexane in a Reflatory Tube Moving-Bed Solids Flow in an Inclined Fige Leading Into a Fluidized Bed, Part I-II Multiplicity and Pollutant Formation for the Combustion of Hexane in a Reflatory Tube Moving-Bed Solids Flow in an Inclined Fige Leading Into a Fluidized Bed, Part I-II Moving-Bed Solids Flow in an Inclined Fige Leading Into a Fluidized Bed, Part I-II Moving-Bed Solids Flow in an Inclined Fige Leading Into a Fluidized Bed, Part I-II Moving-Bed Solids Flow in a Inclined Figure Into Provided Figure Into Provided Figure Into Provid						
Studies  Assa Transfer in Periodically Cycled Plate Columns Containing Multiple Sieve Plates  Measurement Smoothing With a Nonlinear Exponential Filter  Measurement Smoothing With a Nonlinear Exponential Filter  Measurement Sort Deplet Velocities of Turbulent Flow Velocities o				1000		2020
Mass Transfer in Periodically Cycled Plate Columns Containing Multiple Sieve Plates  Measurement Smoothing With a Non-linear Exponential Filter  Measurements of Turbulent Flow Velocity for Sudden Expansion Cylindrical Tube Using Laser Doppler Velocimeter  Josephan Systems  Missibility Limits for Salt Containing Systems  Systems  Missibility Limits for Salt Containing Systems  Mandom Patter Transitions for Random Pore Model for Fluid-Solid Reaction At Chemical Process for Adsorption Solid Reactio		935		1000		593
Plate Columns Containing Multiple Sieve Plates Sieve Plates Measurement Smoothing With a Nonlinear Exponential Filter Measurement Smoothing With a Nonlinear Exponential Filter Measurements of Turbulent Flow Velocity for Sudden Expansion Cylindrical Tube Using Laser Doppler Velocimeter Systems Mixing of Canular Solids in a Rotary Cylindrical Tube Using Laser Doppler Velocimeter Systems Mixing of Canular Solids in a Rotary Cylindrical Tube Systems Mixing of Canular Solids in a Rotary Cylindrical Tube Systems Mixing of Canular Solids in a Rotary Cylindrical Tube Systems Modelling Flow Fattern Transitions for Steady Upward Gas-Liquid Flow in Vertical Tubes Modelling Flow Fattern Transitions in Entrained Flows Modelling Flow Fattern Transitions for Steady Upward Gas-Liquid Flow in Portous Media, On the Moving-Bed Solids Flow in an Inclined Plate Influence of Chemical Pathways and Kinetics on Transitions Beds of Carbon Particles Multiplicity and Pollutant Formation for the Combustion of Hexane in a Refractory Tube Multiplicity and Pollutant Formation for the Combustion of Hexane in a Refractory Tube Multiplicity and Pollutant Formation for the Combustion of Hexane in a Refractory Tube Multiplicity and Pollutant Formation for the Combustion of Hexane in a Refractory Tube Multiplicity and Pollutant Formation for the Combustion of Hexane in a Refractory Tube Multiplicity and Pollutant Formation for the Combustion of Hexane in a Refractory Tube Multiplicity and Pollutant Formation for the Combustion of Hexane in a Refractory Tube Multiplicity and Pollutant Formation for the Combustion of Hexane in a Refractory Tube Multiplicity and Pollutant Formation for the Combustion of Hexane in a Respectation of Experiment Production of Single Bubbles and Drops, A Thermodynamic-Combinatorial Approach to the Design of Optimum Heat Exchanger Networks.  170 Theoretical Criterion of Transition in the Free Motion of Single Bubbles and Drops, A Thermodynamic-Combinatorial Approach to the Optimum Heat Exchanger Networks.  170 Thermodynamic				670		303
Sieve Plates Measurements Tsmoothing With a Non-linear Exponential Filter Measurements of Turbulent Flow Velocity for Sudden Expansion Cylindrical Tube Using Laser Doppler Velocimeter Cal Tube Using Laser Doppler Velocimeter Oscimeters Miscibility Limits for Salt Containing Systems  Modelling Flow Pattern Transitions for Season Apart 1  177  178  Random Capillary Model with Application of Chemscal Path Systems  179  Random Capillary Model with Application of Chemscal Path Systems  170  Restriction Interest of Cash Systems  170  Restriction Interest Systems  170  Restriction Inter				072		916
Measurement Smoothing With a Non-linear Exponential Filter  Measurements of Turbulent Flow Velocity for Sudden Expansion Cylindrical Tube Using Laser Doppler Velocity for Sudden Expansion Cylindrical Tube Using Loser Doppler Velocity Experiments  Mixing of Granular Solids in a Notary Cylindrer  Modelling Flow Pattern Transitions for Steady Upward Gas-Liquid Flow in Vertical Tubes  Modelling Flow Pattern Transitions for Steady Upward Gas-Liquid Flow in Vertical Tubes  Modelling Pulverized Coal Conversion in Entrained Flows  Modelling Pulverized Coal Conversion in Forous Media, On the Moving-Bed Solids Flow in an Inclined Fipe Leading Into a Fluidized Bed, Parts I-II  Multiplicity and Pollutant Formation for the Combustion of Hexane in a Refractory Tube  Multiplicity and Pollutant Formation for the Combustion of Hexane in a Refractory Tube  Multiplicity and Pollutant Formation for the Combustion of Hexane in a Refractory Tube  N  New Approach to Optimization of Chemical Pathways and Kinetics on Transitions Between Steady States  N  New Approach to Optimization of Chemical Pathways and Kinetics on Transitions Between Steady States  N  New Approach to Optimization of Chemical Pathways and Kinetics on Transition of Proteins Vis Multicolumn pH Parametric Pumping  Non-Newtonian Viscous Properties of Methacoal Suspensions  Non-Newtonian Viscous Properties of Methacoal Suspensions  Non-Newtonian Viscous Properties of Methacoal Suspensions  Non-Revolutant Optimization of Chemical Pathways and Kinetics on Transitions Between Steady States  Non-Revolutant Optimization of Chemical Pathways and Kinetics on Transitions Between Steady States  Non-Rewtonian Viscous Properties of Methacoal Suspensions  Non-Revolution of Facility States  Non-Revolution of Staging Method of Measuring Particle Velocity in Phenumate Transport  Noneal Goard Propers of States Sta		663		=00		020
linear Exponential Filter Measurements of Turbulent Flow Velocity for Sudden Expansion Cylindrical Tube Using Laser Doppler Velocimeter Miscibility Limits for Salt Containing Systems Systems Systems Mixing of Granular Solids in a Rotary Cylinder Steady Upward Gas-Liquid Flow in Vertical Tubes Modeling Flow Pattern Transitions for Steady Upward Gas-Liquid Flow in Vertical Tubes Modeling Flow Pattern Transitions for Steady Upward Gas-Liquid Flow in Vertical Tubes Modeling Flow Pattern Transitions for Steady Upward Gas-Liquid Flow in Vertical Tubes Modeling Flow Pattern Transitions for Steady Upward Gas-Liquid Flow in Vertical Tubes Modeling Flow Pattern Transitions for Steady Upward Gas-Liquid Flow in Vertical Tubes Modeling Flow Pattern Transitions for Steady Upward Gas-Liquid Flow in Vertical Tubes Modeling Flow Pattern Transitions for Stable Systems Modeling Flow Pattern Transitions Steady Upward Gas-Liquid Flow in Vertical Tubes Modeling Flow Pattern Transitions for Stable Basic Model Research Steady Upward Gas-Liquid Flow in Vertical Tubes Modeling Flow Pattern Transitions for Stable Basic Model Research Steady Upward Gas-Liquid Flow in Vertical Tubes Modeling Flow Pattern Transitions for Stable Systems  Modelling Flow Pattern Transitions for Steady Upward Gas-Liquid Flow in Vertical Tubes  Modeling Flow Pattern Transitions for Steady Upward Gas-Liquid Flow in Vertical Tubes  Modeling Flow Pattern Transitions for Steady Upward Gas-Liquid Flow in Vertical Tubes  Modeling Flow Pattern Transitions for Steady Upward Gas-Liquid Flow in Vertical Tubes  Modeling Flow Pattern Transitions for Steady Upward Gas-Liquid Flow in Vertical Tubes  Modeling Flow Pattern Transitions for Steady Upward Gas-Liquid Flow in Vertical Tubes  Modeling Flow Pattern Transitions for Steady Upward Gas-Liquid Flow in Vertical Tubes  Modeling Flow Pattern Transitions for Steady Upward Gas-Liquid Flow in Vertical Tubes  Semiempirical Theory of Surface Tension of Binary Systems  Non-Revortanian Viscous Properties of Method of Chemical Tubes			Liquids—A United Approach	522	T	
Measurements of Turbulent Flow Velocity for Sudden Expansion Cylindrical Tube Using Laser Doppler Velocimeter  Miscibility Limits for Salt Containing Systems  Mising of Granular Solids in a Rotary Cylinder  Modelling Flow Pattern Transitions for Steady Upward Cast-Liquid Flow in Vertical Tubes  Modelling Flow Pattern Transitions for Steady Upward Cast-Liquid Flow in Vertical Tubes  Modelling Pulverized Coal Conversion in Entrained Flows  Modeling Pulverized Coal Conversion in Entrained Flows  Movement of Multiple Reaction Zones in Forous Media, On the Moving-Bed Solids Flow in an Inclined Fipe Leading Into a Fluidized Bed, Parts I-II  Moving-Bed Solids Flow in an Inclined Fipe Leading Into a Fluidized Bed, Parts I-II  Multiplicity and Pollutant Formation for the Combustion of Hexane in a Refractory Tube  Multiplicity and Pollutant Formation for Binding Systems  N  New Approach to Optimization of Chemical Processes, A  Non-Newtonian Viscous Properties of Methacoal Suspensions  N  New Approach to Optimization of Chemical Processes, A  Non-Newtonian Viscous Properties of Methacoal Suspensions  Non-Revtonian Properties of Methacoal Suspensions  Non-Revtonian Viscous Properties of Methacoal Suspensions  No		132		00=		
ity for Sudden Expansion Cylindic cal Tube Using Laser Doppler Velocimeter			stable Systems	305		
acl Tube Using Laser Doppler Velocimeter  Miscibility Limits for Salt Containing Systems  Miscip Of Granular Solids in a Rotary Cylinder  Mixing of Granular Solids in a Rotary Cylinder  Modelling Flow Pattern Transitions for Steady Upward Gas-Liquid Flow in Vertical Tubes  Modelling Flow Pattern Transitions for Steady Upward Gas-Liquid Flow in Vertical Tubes  Modeling Pulverized Coal Conversion in Entrained Flows  Movement of Multiple Reaction Zones in Porous Media, On the  Moving-Bed Solids Flow in an Inclined Pipe Leading Into a Fluidized Bed, Parts I-II  Multiplicity and Follutant Formation for the Combustion of Hexane in a Refractory Tube  Multiplicity and Pollutant Formation for the Combustion of Hexane in a Refractory Tube  Multiplicity and Pollutant Formation for the Solygen-Nitrogen Flame: The Infiluence of Chemical Pathways and Kinetics on Transitions Between Steady States  Nowleap Processes, A  Non-Newtonian Viscous Properties of Methacoal Suspensions  Nonradioactive Tagging Method of Measuring Particle Velocity in Pneumatic Transport  Nonradioactive Tagging Method of Measuring Particle Velocity in Pneumatic Transport  Nonradioactive Tagging Method of Measuring Particle Velocity in Pneumatic Transport  Nonradioactive Tagging Method of Measuring Particle Velocity in Pneumatic Transport  Nonradioactive Tagging Method of Measuring Particle Velocity in Pneumatic Transport  Nonradioactive Tagging Method of Measuring Particle Velocity in Pneumatic Transport  Nonradioactive Tagging Method of Measuring Particle Velocity in Pneumatic Transport  Nonradioactive Tagging Method of Measuring Particle Velocity in Pneumatic Transport  Nonradioactive Tagging Method of Measuring Particle Velocity in Pneumatic Transport  Nonradioactive Tagging Method of Measuring Particle Velocity in Pneumatic Transport  Nourille Device Action of Silage Proposed of Methanol in Compile Methacoal Supring Particle Velocity in Pneumatic Transport  Nourille Deviction of Silage Proposed National Methanol in Compile Solida Flow in Entraprodo O						
ocimeter 303 Random Capillary Model with Application to Char Gasification at Chemically Controlled Rates, A 2025 actions, A Part I 2025 actions actions, A Part I 2025 actions actions, A Part I 2025 actions actions, A Par			R			170
Missibility Limits for Salt Containing Systems  Missing of Granular Solids in a Rotary Cyl- inder  Missing of Granular Solids in Rotary Cyl- inder  Modelling Pluverized Coal Conversion in Entropy of Drops and Bending  Entrained Flows  Rectilinearity Rule for Vapor and Liquid  Densities Along the Azeotropic  Restrictions and Equivalence of Optimal  Temperature Policies for Reactors  with Decaying Catalysts  Semiempirical Theory of Surface Tension  of Binary Systems  Tospen-Oxygen-Nitrogen Flame: The  Influence of Chemical Pathways  and Kinetics on Transitions Be-  tween Slury Reactors (Journal Re-  view)  Three Phase Slury Reactors (Journal Re-  view)  Throughflow Drying and Conditioning of Beds of Moisture and Tem-  perature Fonts.  Separation of Ethylbenzene from p- and  m-Xylene by Extractive Distillation  Using Mistures of Polychloro Com-  pounds. The  Separation		303	Bandom Capillary Model with Applica-			
Systems Sixing of Granular Solids in a Rotary Cylinder or Steady Upward Gas-Liquid Flow in Vertical Tubes Steady State Characteris Steady State States States Steady State States St						
Mixing of Granular Solids in a Rotary Cylinder of Mixing of Granular Solids in a Rotary Cylinder of Steady Upward Gas-Liquid Flow in Vertical Tubes of Steady Upward Gas-Liquid Flow in Vertical Tubes of Modeling Pulverized Coal Conversion in Entrained Flows of Multiple Reaction Zones in Porous Media, On the owing Bed Solids Flow in an Inclined Pipe Leading Into a Fluidized Bed, Parts I-II of the Combustion of Hexane in a Refractory Tube of the Combustion of Hexane in a Refractory Tube of Hultiplicity and Stability of the Hydrogen-Oxygen-Nitrogen Flame: The Influence of Chemical Pathways and Kinetics on Transitions Between Steady States on Transitions Between Steady States on Transitions Between Steady States of Transition of Chemical Processes, A of Methacoal Suspensions of Measuring Particle Velocity in Pneumatic Transport to Liquid Mass Transport in Liquid-Membrane Systems of Sugaration and Evolution of Slag prop-  Mixing of Granular Solids Flow actions, A. Part I of Denris Note actions, A. Part I of Denris Note actions, A. Part I of Denris Note of Coptinal Reactions of Coptinal Particles Along the Azeotropic Locus of Destities Along the Azeotropic Locus of Coptinal Temperature Policies for Reactors with Decaying Catalysts of Simulative and Emperature Policies for Reactors with Decaying Catalysts of Simulative and Stability of the Hydrogen-Oxygen-Nitrogen Flame: The Influence of Chemical Pathways and Kinetics on Transitions Between Steady States of Simulation of Ethylbenzene from p- and m-Xylene by Extractive Distillation Using Mixtures of Polychloro Compounds, The Separation of Ethylbenzene from p- and m-Xylene by Extractive Distillation Using Mixtures of Polychloro Compounds, The Separation of Proteins Via Multicolumn pH Parametric Pumping of Methanol in Compressed National Particle States of District Profession of Actions and Equivalence of Optimal Temperature Policies for Reactors with Decaying Catalysts of Simulation of Ethylbenzene from p- and m-Xylene by Extractive Distillation Using Mixtures of Polychl		675		577		1
actions, A, Part I Rebatfal of Carbon Particles Steady Upward Gas-Liquid Flow in Vertical Tubes Modelling Pulverized Coal Conversion in Entrained Flows Modelling Pulverized Coal Conversion in Entrained Flows Movement of Multiple Reaction Zones in Porous Media, On the Moving-Bed Solids Flow in an Inclined Pipe Leading Into a Fluidized Bed, Parts I-II Sultiplicity and Pollutant Formation for the Combustion of Hexane in a Refractory Tube Multiplicity and Stability of the Hydrogen-Oxygen-Nitrogen Flame: The Influence of Chemical Pathways and Kinetics on Transitions Be- tween Steady States  N New Approach to Optimization of Chemical Processes, A Non-Newtonian Viscous Properties of Methacoal Suspensions N New Approach to Optimization of Chemical Processes, A Non-Newtonian Viscous Properties of Methacoal Suspensions Non-new				311		
Modelling Flow Pattern Transitions for Steady Upward Gas-Liquid Flowin Vertical Tubes		928		370		
Steady Upward Gas-Liquid Flow in Vertical Tubes				319		
Rebuttal of Denn's Note   Rectilinearity Rule for Vapor and Liquid   Densities Along the Azeotropic   Locus   Restrictions and Equivalence of Optimal Temperature Policies for Reactors with Decaying Catalysts   Semiempirical Theory of Surface Tension of the Combustion of Hexane in a Refractory Tube   Semiempirical Theory of Surface Tension of Binary Systems   Sematation of Ethylbenzene from p- and m-Xylene by Extractive Distillation Using Mixtures of Polychloro Compounds, The Separation of Ethylbenzene from p- and m-Xylene by Extractive Distillation Using Mixtures of Polychloro Compounds, The Separation of Ethylbenzene from p- and m-Xylene by Extractive Distillation Using Mixtures of Polychloro Compounds, The Separation of Ethylbenzene from p- and m-Xylene by Extractive Distillation Using Mixtures of Polychloro Compounds, The Separation of Ethylbenzene from p- and m-Xylene by Extractive Distillation Using Mixtures of Polychloro Compounds, The Separation of Ethylbenzene from p- and m-Xylene by Extractive Distillation Using Mixtures of Polychloro Compounds, The Separation of Ethylbenzene from p- and m-Xylene by Extractive Distillation Using Mixtures of Polychloro Compounds, The Separation of Ethylbenzene from p- and m-Xylene by Extractive Distillation Using Mixtures of Polychloro Compounds, The Separation of Ethylbenzene from p- and m-Xylene by Extractive Distillation Using Mixtures of Polychloro Compounds, The Separation of Ethylbenzene from p- and m-Xylene by Extractive Distillation Using Mixtures of Polychloro Compounds, The Separation of Ethylbenzene from p- and m-Xylene by Extractive Distillation Using Mixtures of Polychloro Compounds, The Separation of Ethylbenzene from p- and m-Xylene by Extractive Distillation Using Mixtures of Polychloro Compounds, The Separation of From Selective Peremeation Simulation of a Pilot Scale, Liquid Motivated, Venturi Jet Scrubber by a Laboratory Scale Model Simulation of a Pilot Scale, Liquid Jet Scale,				044		212
Modeling Pulverized Coal Conversion in Entrained Flows  Movement of Multiple Reaction Zones in Porous Media, On the Moving-Bed Solids Flow in an Inclined Pipe Leading Into a Fluidized Bed, Parts I-II  Multiplicity and Pollutant Formation for the Combustion of Hexane in a Refractory Tube  Multiplicity and Stability of the Hydrogen-Oxygen-Nitrogen Flame: The Influence of Chemical Pathways and Kinetics on Transitions Between Steady States  N  New Approach to Optimization of Chemical Processes, A  Non-Newtonian Viscous Properties of Metacoal Suspensions  Non-Newtonian Viscous Properties of Metacoal Suspensions  Non-Readonian Viscous Properties of Metacoal Suspensions  Novel Rotated Disc Electrode and Time Lag Method for Characterizing Amas Transport in Liquid-Membrane Systems  101  New Borrand Flows  Rectilinearity Rule for Vapor and Liquid Densities Along the Azeotropic Locus  Restrictions and Equivalence of Optimal Temperature Policies for Reactors with Decaying Catalysts  8		345				
Entrained Flows  Porous Media, On the		0.0		294		177
Movement of Multiple Reaction Zones in Porous Media, On the		964				
Porous Media, On the		001		201		
Moving-Bed Solids Flow in an Inclined Pipe Leading Into a Fluidized Bed, Parts I-II		403		301		
Pipe Leading Into a Fluidized Bed, Parts I-II		400				
Parts I-II  Multiplicity and Pollutant Formation for the Combustion of Hexane in a Refractory Tube  Multiplicity and Stability of the Hydrogen-Oxygen-Nitrogen Flame: The Influence of Chemical Pathways and Kinetics on Transitions Between Steady States  N  New Approach to Optimization of Chemical Processes, A  Non-Newtonian Viscous Properties of Methacoal Suspensions  Nonradioactive Tagging Method of Measuring Particle Velocity in Pneumatic Transport  Lag Method for Characterizing Mass Transport in Liquid-Membrane Systems  Nucleation and Evolution of Slag Drop-  24  Semiempirical Theory of Surface Tension of Binary Systems  Separation of Ethylbenzene from p- and m-Xylene by Extractive Distillation Using Mixtures of Polychloro Compounds, The Separation of Fresh and Fouled Nickel Hydrogenation Catalyst  Transport Accompanied by Chemical Reaction in Stagnation Flow  Transport Phenomena in Solids with Bidispersed Pores  Two-Phase Pressure Drop in Cocurrent Downflow in Packed Beds: Air-Silicone Oil Systems  310  Notivated, Venturi Jet Scrubber by a Laboratory Scale Model  Simulation of a Pilot Scale, Liquid Motivated, Venturi Jet Scrubber by a Laboratory Scale Model  Liquid Jet  Liquid Jet  Yuscancy Solution Theory of Adsorption  From Gas Mixtures  Yelocity Profiles of Viscoelastic Fluids at the Inlet of an Annulus  Liquid Jet  Yelocity Profiles of Viscoelastic Fluids at the Inlet of an Annulus  Newholton Theory of Adsorption Set to Profiles of Viscoelastic Fluids at the Inlet of an Annulus  North April 194  Transport Accompanied by Chemical Reaction in Stagnation of Proteins Via Multicolumn ph Parametric Pumping  Solimulation of a Pilot Scale, Liquid  Motivated, Venturi Jet Scrubber by a Laboratory Scale Model  Separation of Proteins Via Multicolumn ph Parametric Pumping  Transport Acc				227		625
Multiplicity and Pollutant Formation for the Combustion of Hexane in a Refractory Tube		94	with Decaying Catalysts	321	Transient and Steady State Characteris-	
the Combustion of Hexane in a Refractory Tube Multiplicity and Stability of the Hydrogen-Oxygen-Nitrogen Flame: The Influence of Chemical Pathways and Kinetics on Transitions Between Steady States  Non-New Approach to Optimization of Chemical Processes, A  Non-Newtonian Viscous Properties of Methacoal Suspensions  Non-Newtonian Viscous Properties of Methacoal Suspensions  Nonradioactive Tagging Method of Measuring Particle Velocity in Pneumatic Transport  Lag Method for Characterizing Mass Transport in Liquid-Mass Transport in Liquid-Membrane Systems  Nucleation and Evolution of Slag Drop-  Transient Behavior of Fresh and Fouled Nickel Hydrogenation Catalyst  Transport Accompanied by Chemical Reaction in Stagnation Flow  Not Separation of Ethylbenzene from p- and m-Xylene by Extractive Distillation Using Mixtures of Polychloro Compounds, The Separation of Krypton and Xenon by Selective Permeation  Separation of Proteins Via Multicolumn of Ph Parametric Pumping  Simulation of a Pilot Scale, Liquid Motivated, Venturi Jet Scrubber by a Laboratory Scale Model  Simulataneous Melting and Freezing in the Impingement Region of a Liquid Jet  Single-Particle Char Gasification Model, A  Solvent Losses in Gas Adsorption, Solubility of Methanol in Compressed  Transient Behavior of Fresh and Fouled Nickel Hydrogenation Catalyst  Transport Accompanied by Chemical Reaction in Stagnation Flow  Nickel Hydrogenation Catalyst  Transport Accompanied by Chemical Reaction in Stagnation Flow  Northeonian Viscous Properties of Methacolal Swith Bidispersed Pores  Two-Phase Pressure Drop in Cocurrent Downflow in Packed Beds: Air-Silicone Oil Systems  Simulation of a Pilot Scale, Liquid  Motivated, Venturi Jet Scrubber by a Laboratory Scale Model  Simulation of a Pilot Scale, Liquid  Motivated, Venturi Jet Scrubber by a Laboratory Scale Model  Simulation of a Pilot Scale, Liquid  Motivated, Venturi Jet Scrubber by a Laboratory Scale Model  Simulaticolumn of a Pilot Scale, Liquid  Motivated, Venturi Jet Scrubber by a Liquid Jet Scale Scale						
Semiempirical Theory of Surface Tension of Binary Systems			S			139
Multiplicity and Stability of the Hydrogen-Oxygen-Oxygen-Nitrogen Flame: The Influence of Chemical Pathways and Kinetics on Transitions Between Steady States		855	Semiempirical Theory of Surface Tension			
Separation of Ethylbenzene from p- and m-Xylene by Extractive Distillation Using Mixtures of Polychloro Compounds, The Separation of Krypton and Xenon by Selective Permeation Non-Newtonian Viscous Properties of Methacoal Suspensions Non-Newtonian Viscous Properties of Measuring Particle Velocity in Pneumatic Transport Nonradioactive Tagging Method of Measuring Particle Velocity in Pneumatic Transport Nowel Rotated Disc Electrode and Time Lag Method for Characterizing Mass Transport in Liquid-Membrane Systems Nucleation and Evolution of Slag Drop-  Separation of Ethylbenzene from p- and m-Xylene by Extractive Distillation Using Mixtures of Polychloro Compounds, The Separation of Krypton and Xenon by Selective Permeation Separation of Froteins Via Multicolumn ph Parametric Pumping Simulation of a Pilot Scale, Liquid Motivated, Venturi Jet Scrubber by a Laboratory Scale Model Simulation of a Pilot Scale, Liquid Motivated, Venturi Jet Scrubber by a Laboratory Scale Model Simulation of a Pilot Scale, Liquid Motivated, Venturi Jet Scrubber by a Laboratory Scale Model Simulation of a Pilot Scale, Liquid Motivated, Venturi Jet Scrubber by a Laboratory Scale Model Simulation of a Pilot Scale, Liquid Motivated, Venturi Jet Scrubber by a Laboratory Scale Model Simulation of a Pilot Scale, Liquid Motivated, Venturi Jet Scrubber by a Laboratory Scale Model Simulation of a Pilot Scale, Liquid Motivated, Venturi Jet Scrubber by a Laboratory Scale Model Simulation of a Pilot Scale, Liquid Motivated, Venturi Jet Scrubber by a Laboratory Scale Model Simulation of a Pilot Scale, Liquid Motivated, Venturi Jet Scrubber by a Laboratory Scale Model Simulation of a Pilot Scale, Liquid Motivated, Venturi Jet Scrubber by a Laboratory Scale Model Scipulation of a Pilot Scale, Liquid Motivated, Venturi Jet Scrubber by a Laboratory Scale Model Scipulation of a Pilot Scale, Liquid Motivated, Venturi Jet Scrubber by a Laboratory Scale Model Scipulation of a Pilot Scale, Liquid Motivated, Venturi Jet Scrubber by a Laboratory Scale Model Scipu		000		705		319
Influence of Chemical Pathways and Kinetics on Transitions Between Steady States	gen-Ovygen-Nitrogen Flame: The			100	Transport Accompanied by Chemical	
A Separation of Chemical Processes, A					Reaction in Stagnation Flow	635
tween Steady States					Transport Phenomena in Solids with	
New Approach to Optimization of Chemical Processes, A		725		869	Bidispersed Pores	787
Selective Permeation	tween steady states	120		002	Two-Phase Pressure Drop in Cocurrent	
New Approach to Optimization of Chemical Processes, A	N			881	Downflow in Packed Beds: Air-	
ical Processes, A	New Approach to Optimization of Chem-			991	Silicone Oil Systems	314
Non-Newtonian Viscous Properties of Methacoal Suspensions		37		830		
Methacoal Suspensions		0.		000	V	
Nonradioactive Tagging Method of Measuring Particle Velocity in Pneumatic Transport		310			Vacancy Solution Theory of Adsorption	
Measuring Particle Velocity in Pneumatic Transport		010		282		76
Pneumatic Transport				202		.0
Novel Rotated Disc Electrode and Time Lag Method for Characterizing Mass Transport in Liquid- Membrane Systems		395			KPa and 400°C. A Now Statio	
Lag Method for Characterizing Mass Transport in Liquid- Membrane Systems		020		742		879
Mass Transport in Liquid- Membrane Systems				140		012
Membrane Systems				497		162
Nucleation and Evolution of Slag Drop- ubility of Methanol in Compressed Volatiles Loss During Atomization in		1012		401		
		1013				101
Adduta and Symmetic Gases 402 Spray Drying		655		460		718
	iets in Coa Combustion	000	Natural and Synthetic Gases	402	Spray Drying	110

Absorbe Absorbe concer Absorpti disper solven Absorpti identif operat pilot p interac Adsorpti absolu equilil gas, 68 isothe linear, nonun reactiv solutio Adsorpti defini negati nonph prope Aeration param Aerosol balanc behav conde depos distril filtrati partic size-d Ammon decon Azeotro behav densi

Bidisper conse Binary calcul corremicro suppi virial Binary effect surfac Bubblet fractiisolat swarn trajec

Carbon Carbon adsor diffus diffus facilit press profil tertia value

AICh

# Subjects

A	Cascade system
Absorbed molecules, 363	control of tempera design, 892
Absorber concentration of liquid, 500	Catalyst
Absorption	activity and reacti
dispersion, 158	bidisperse porous
solvent losses, 467	catalyzed reaction characterization, §
Absorption-desorption identification of control, 500-501	ethylene hydratio
operating parameters, 499	loadings, 191
pilot plant, 496	nickel, 187, 319
Adsorbate	olefin hydration, pellet, 56, 148
interactions, 79 Adsorption	poisoning behavio
absolute, 619	regeneration, 136
equilibrium, 945	Catalytic parameter Catalytic converter,
gas, 68, 76 isosteric heat, 73-75	Cell model for disp
isotherms, 72-73, 478, 714	Char
linear, 478	devolatilization an entrainment, 645
nonuniform surfaces, 358 reactive, 479	gasification, 577,
solution theories, 80	physical propertie
Adsorptive reactor	Chemical processes
definition, 477	computational alg control structures
negative step, 480 nonphysical profile, 481	optimization, 37
property, 482	synthesis of contr
Aeration	Chemical reaction
parameters of experiments, 631	control, 736 diffusion, 871
Aerosol balance equations, 615	in stagnation flow
behavior, 611	rate, 179
condensation rate, 615	variation, 159 Chlorination
deposition of fibers, 444 distribution, 612-613	control, 736
filtration, 443, 678	effect, 740
particles, 447	free energies, 735
size-dependent growth rate, 614	kinetics, 734 measurement tecl
Ammonia plant decomposition, 224-226	transport properti
Azeotropic locus	Chromatograms
behavior, 301	analysis of compo- experimental, 483
density, 302	reactive adsorptio
В	Coal
Bidispersed pores	bituminous, 970
conservation equation, 789-792	bulk density and conversion, 964
Binary mixtures calculation scheme, 459	particle, 969
correlation, 454	pulverized, 368
microscopic heat transfer coefficients, 458	pump test data, 3
suppression factor, 458	Coal combustors dimensions, 652
virial coefficients, 464 Binary systems	emulsion and bul
effect of molecular sizes, 707	energy balance, 6
surface tensions, 708-710	fluidized bed, 64 hydrodynamics co
Bubble(s) fraction of gas, 395	material and ener
isolated, 309	rate controlling r
swarm, 394	Coal particle
trajectories, 391	hydropyrolysis, 3 mass balances, 20
C	Coal pyrolysis
Carbon balance, 489	mass transfer, 20
Carbon dioxide	Coefficients
adsorption, 944	binary methanol
diffusion coefficients, 154, 156 diffusivity and solubility in water, 115	dispersion of por- drag, 767
facilitated transport, 112, 116-117	equilibrium, 599

1044

507

260

1029

419

98

220

948

1020

916

170

212

177

625

139

319

635

787

314

76

872

162

751

718

lo. 6)

Cascade system
control of temperature, 306
design, 892
Catalyst
activity and reaction, 57-59
bidisperse porous, 287
catalyzed reaction, 179
characterization, 517
ethylene hydration, 135
loadings, 191
nickel, 187, 319
olefin hydration, 134
pellet, 56, 148
poisoning behavior, 58
regeneration, 136
Catalytic parameter, 641
Catalytic converter, 935
Cell model for dispersion, 531-532, 605
Char
devolatilization and combustion, 643
entrainment, 645
gasification, 577, 580
physical properties, 491
Chemical processes:
computational algorithm, 40-41
control structures, 975
optimization, 37
synthesis of control structure, 220
Chemical reaction
control, 736
diffusion, 871
in stagnation flow, 637
rate, 179
variation, 159
Chlorination
control, 736
effect, 740
free energies, 735
kinetics, 734
measurement techniques, 738
transport properties, 737
Chromatograms
analysis of components, 482
experimental, 483
reactive adsorption, 480-481
Coal
bituminous, 970
bulk density and permeability, 367
conversion, 964
particle, 969
pulverized, 368
pump test data, 369
Coal combustors
dimensions, 652
emulsion and bubble phases, 647
energy balance, 649
fluidized bed, 642
hydrodynamics correlations, 650
material and energy balances, 646
rate controlling regimes, 644
Coal particle
hydropyrolysis, 325
mass balances, 205
Coal pyrolysis
mass transfer, 201
Coefficients
binary methanol systems, 464-467
dispersion of porous media, 513-515
drag 767

expansion, 942

mass transfer, 716

first-order hindrance, 821

heat transfer, 543, 547-548, 850

reaction rate, 730 second virial, 858, 954 self-diffusion, 522 wall deactivation, 575 Computer control system, 497 digital, 585 input/output measurements, 502 nonlinear program, 518 plant response, 503 program, 596 Constants Henry's and Margules, 468 Constrained data analysis, 260 variables, 264 Constraint equations error matrices, 263 measurements and parameters, 262 Continuous model for dispersion, 532-534 Control schemes synthesis, 232 Control objectives definition, 222 measurements, 223 Control structure(s) algorithm, 240 analysis, 234, 236 infeasible example, 238 modification, 980 optimization, 223, 230 synthesis of process, 222, 227, 239 Williams-Otto plant, 243-244 Control tasks disturbances and decomposition, 229 Critical points application, 771 calculation, 769 high density, 776 stability, 770, 772 vapor-liquid, 773 Crude oil identification, 343 mixture, 343 Crystallizer growth rate model, 508 isothermal, 507 size-dependent model, 508 stability regime, 509 Cylinder circular, 637 effect of electrostatic fields on, 680 hydrodynamic model, 636 rotary, 928 Deactivation, 951 catalyst, 953 rate, 1025 Decomposition criteria, 225 evaluation, 230 multilayer, 223 process, 229 regulatory structures, 239 Dehydrogenation to benzene, 483 Dendrite age and position, 451

values of CO2-crude oil mixtures, 344

pressure drop, 151

profile at total reflux, 563-564

tertiary oil recovery, 341

distribution function, 449

Damkohler numbers, 408, 605

effect on ash carryover, 662

growth on fiber, 452

critical points, 776

Density

molecules, 314 saturated liquid 337-339 Desorber concentration of liquid, 500 Diffusion binary, 1046 Brownian, 444 convective, 637 heat and mass, 869 intraparticle, 181 limitations in catalysts, 287 properties, 148 surface, 360 Diffusive cells, 148 Diffusivity effect, 941 intraparticle, 195 pure liquids, 387 Digital controller response to load, 296 time-delay processes, 295 variables, 295 Dispersion coefficients, 415, 513 diffusive, 416 metal, 940 model, 531 reactive, 417 Distillation adiabatic, 267 availability loss, 268 column, 986 conventional, 270 extractive, 862 isobaric reversible, 267 SRV, 269 vapor recompression, 269 volatilities, 863 Distillation column improved design, 265 structural matrix, 241-242 Disturbances response of system, 256-258 Draw resonance analysis, error in logic, 294 definition, 293 Drop trajectory constants, 764 parameters, 765 Electrolysis cathodic hydrogen evolution, 796 characteristic data, 799 water decomposition, 795 Energy activation, 359 balance, 489 free, 735 measurements, 638 variation of magnitude, 218 Entropy dispersion, 212 Equilibrium adiabatic, 626 adsorption, 714 theory, 596, 605-607 vapor-liquid, 377, 872 Evaporator double-effect, 233-234, 237, 241, 253 Fifth-order model, 255

Gas

absorption, 832

accumulation of solid particles, 289-291 optical, 1001 Fibrous filter transient behavior, 450-451 Filter fibrous, 443

linear and nonlinear exponential, 132-133 response to noise, 133 Filtration efficiency, 401 Fixed-bed fluid dispersion, 529 annular, 351 concurrent, 151 control, 663 main, 446 Newtonian, 152-153 pattern, 352-353 plug, 571 Poiseuille, 572 radial component, 446 rates, 565 slip factor, 453 stagnation, 637 uniform, 514 Flow system, 304 Flow tube reactor experimental apparatus, 569

mathematical model, 570 sampling technique, 573 wall deactivation, 574 Fluid(s) fluidized beds, 144 interstitial, 529 mass transfer coefficient, 138 Newtonian, 505 power-law, 505 properties, 93 pure, 465-466

velocity, 162, 171 viscoelastic, 683 Fluidized beds comparison of different models, 549 heat transfer, 544

backflow, 369 chromatography, 209 composition, 972 effect of composition, 318 leakage, 27, 29 mixing, 186 pressure, 28, 29, 370 reaction, 191 separation, 559, 883 velocity, 192 Gasification concentration, 491 conversion profiles, 492 Effectiveness factors, 490 rate, 488 single-char particle, 487 steam, 488 theory vs. data, 582-583 typical model, 488 Gas-liquid

# H

mass transfer coefficient, 192

fluid mechanical behavior, 314

Gas-liquid-solid system

computation, 783

physical situation, 780

Graetz problem

solution, 781

Heat conduction, 829 generation, 754-756 integration, 916 principle of operations, 8 problems, 4-7 reaction, 727

Heat exchange availability loss, 266 Heat exchanger, 1, 60-66 two-stream, 267 Heat load, 2, 5 Heat loss, 66 Heat transfer, 20-21 coefficients, 191, 457 control, 18 convection, 505 laminar, 683 mass transfer effect, 457 microscopic, 458, 657 unsteady, 536 values, 759 Heater heat transfer experiments, 546 Hopper configuration, 297 fluid pressure, 298 Humidity breakthrough ratio, 628 Hydrogenation acetone, 187 acetylide, 188 dinitrotoluene, 188 nickel, 188 propylene oxide, 189 Hydrodesulfurization gas chromatographic analysis, 691 processes, 690

**Isothermal** rate equations, 520 regression, 520 Isotherms adsorption for methane, 619-621 function, 633-634 moisture, 629 Isotropic turbulence, 555

Kinetic(s) control, 583 dehydration on catalyst, 518 different models, 183, 488 effectiveness factor, 181 equilibrium, 657 experimental setup, 638-640 mechanisms, 730 parameters, 196 reaction, 727 substrate-inhibited, 948, 1020 values, 99-100 Knudsen number, 444, 657 Kuwabara cell, 444

Laser Doppler velocimeter, 303 Latent heat(s) compared values, 374 modification of heat transfer effect, 461 ambivalence range, 52-54 chemical potential measurements, 44-47 coal liquids, 83, 85 continuity, 92-93 diffusion vs. correlation, 45, 48 holdup correlations, 318 liquid-liquid dispersions, 51 liquid-liquid separation, 777 membrane system, 1013 mixing, 84 non-ideal solutions, 49 rotating, 394 Liquid-full operation adsorption equilibrium constant, 715 conditions, 712 function, 714

Magneti Marqua Mass tra binary cataly coeffic contro dual f exper gas-to liquid param separa ternai Melting compa effect proce rate, veloci

Membra

contin

gas se meast Methan cost o fugaci solub Microe theor Micro-o applie bioch bioma comp mixed stabil theor Minera dissol distar mole reacti

Newton flow, heat Newton Nonequ adiab theor Nuclea partic rate f slag o

syste

witho

tar, 2

Mixer-b

Mole fr

Nusselt as fur asym calcu exter pure Oil gan

coale dispe dyna fissio math mobi quasi stoch stran

AICh

field signal, 133

Magnetic separation, 1041 Marquardt's algorithm, 518

Mass transfer
binary, 207
catalytic reaction, 639
coefficient, 1029
control, 736
dual flow, 667
experiments, 640
gas-to-particle, 946
liquid-phase, 1034
parameters, 160

parameters, 160 separation of mixtures, 663 ternary, 205

Melting compatibility, 746

effect of subcooling, 831-832 process, 744 rate, 748

velocity and temperature, 747

Membrane column
continuous, 560
gas separation, 559
messurement, 563

measurement, 563
Methanol
cost of loss, 469

fugacity and virial coefficients, 463-464 solubility, 463

Microemulsions theory, 212 Micro-organisms applications, 808

biochemical reactor, 802 biomass concentrations, 807 competition, 812 mixed culture phenomena, 803

stability analysis, 809 theoretical background, 804

Mineral(s) dissolution, 404 distance of separation, 406 mole balances, 407 reaction fronts, 406-407 system, 407

Mixer-blender without heat effect, 240

Mole fraction tar. 206

N

Newtonian fluid flow, 757 heat transfer, 759

Newton-Raphson technique, 585

Nonequilibrium adiabatic, 627 theory, 597, 609 Nucleation

Oil ganglion

61

47

particle growth, 656 rate for ash carryover, 659-662 slag droplets, 655 Nusselt number

as function of time, 541 asymptotic, 542 calculation, 539 external, 537 pure convection, 505

0

coalescence, 435
dispersion coefficients, 427
dynamics, 427, 430, 433
fission, 433
mathematical formulation, 439
mobilization and breakup, 421, 424-425
quasistatic diformation, 431
stochastic simulation, 422
stranding coefficients, 427

Oxidation rate, 189 SO<sub>2</sub>, 189 Oxygen profile at total reflux, 563-564

Packed bed(s) application, 912 dispersion, 686 filter, 400 heat transfer, 530 idealized, 535 wave character, 530

Packed bed reactors dispersion, 275, 279 evaluation of parameters, 279 pulse responses, 277-278

pulse responses, 277-278

Particle(s)
chain formation, 678
diffusion, 686
effect of size, 547
entrained, 396
fluxes, 447
gravitational deposition, 700
inertialess, 698
influence of size, 494
motion in freeboard region, 395
size vs. travel time, 396
trajectory, 931
values of function, 699
various residence time, 547

Permeability absolute, 436 cascade, 893 measurements, 885 rèlative, 437

Permeation selective, 881 Photopolymerization experimental apparatus, 673 photochemical initiation, 674

photochemical initiation, 674 use of catalysts, 672 Pollutant(s)

Pollutant(s) combustion, 856 cost-effective treatments, 322 formation, 855 theoretical analysis, 323-325 Polymerization

photosensitized, 674 plant, 228 polymer solutions, 852

Pore structure model development, 380 optimal, 383 Petersen models, 384 values, 382

function, 409-410 Porosity derivation, 579 equations, 380-381

Pore volume

Porous medium flow rate, 436 formulation, 433 model, 432 volume, 579

Prandtl numbers correlation development, 456 effect, 457, 505-506 heat transfer coefficient, 850

Pressure
build-up, 207
density, 903
drop, 151, 315-316
effect, 210, 493
excess, 475-476
function, 469
intensity, 574
measurements, 884
zero ratio, 562

input/output records, 306

centrifugal, 363 McCabe-Thiele representation, 123-130 open parametric, 120

operating cycle, 122-123

Pumping
graphical solutions, 843-844
one-column system, 840
steady state separations factors, 846

two-column systems, 841

Pyrolysis benzene, 671 coal, 209 mass transfer, 205 spherical particle yields, 209

Q

Quasilinearization algorithm, 670 parameter for convergence, 671

R

Random capillary model porous structure, 578 Reactant, 480, 1020

Reaction behavior under various conditions, 405 first-order, 1004

fluid-solid, 379 homogeneous, heterogeneous, 185, 404 particles, 185 rate, 181

rate, 181 reversible, 184 stream, 61 zero-order, 182 zones, 406

Reactor assembly, 62 backmix and tubular, 134 catalytic fluidized-bed, 139 cocurrent run, 62, 66 containment, 899 control system, 305 countercurrent operation, 65-

countercurrent operation, 65-66 dynamics, 966 failure, 1020 gas-liquid, 157 nuclear, 891 parametric sensitivity, 66 performance, 1026 selection, 107-111 slurry, 177 thermocouples, 914 Regression analysis

critical velocity data, 556
Reynolds number, 395
evaluation of velocity, 819
function of particle, 555
liquid droplet, 538
rigid particles, 820
settling of suspension, 816
values, 821
Rotating fluidized bed
fluid dynamic features, 391

S

Salt solution systems solution instability, 676 stability parameters, 677 Saturated properties compared values, 374 Self-diffusion and -diffusivity coefficient, 387, 389 correlation, 388 values, 389 Separators

arrangement, 588-590 Gauss elimination technique, 591 general model, 586 interlinked, 587 Sherwood number

function of distance, 300

Sieve plate column, 666 mass transfer, 667

periodic cycling, 668 Sludge(s)

compressibility and permeability, 472 effect of funneling, 475 thickening theory, 471

concentration, 552 pipeline flow, 550

Slurry reactors dynamics, 198 first-order reaction, 187

particles, 191, 546 Solid-gas separation, 443 Solid-liquid

mass transfer coefficient, 194
Solids flow
friction factor correlation, 32-3

friction factor correlation, 32-34 measurement methods, 36 Solubility

change, 190 methanol, 463 Solutes diffusion-limites

diffusion-limited, 1017 parameters, 313 Solution

vacancy solution, 82

Solvent
antisolvent agglomeration, 84
dispersion of antisolvent, 88

losses in absorption, 463, 469 forption curves of CO<sub>2</sub>, 19 kinetics, 1044

volume and characteristics, 619 Spray drying drag effects, 720 operating procedures, 719 volatiles effect, 722

Sprue flow situation, 364 gas pressure, 365, 369 gas velocity, 365

Steady-state control, 984 discharge flow tube, 569 measurement criteria, 249-251, 603 multiple, 730 optimization, 977 photochemical initiation, 674 reconstruction, 253 solutions, 612 Stefan-Maxwell equation, 490 Sulfur dioxide

aqueous solutions, 597
equilibrium theory, 596
flux, 604
nonequilibrium approximation

nonequilibrium approximation, 598 scrabbing, 600 separation, 599

transport, 594 Surfactant

concentration, 217-218, 1011 effect, 1008 film, 213

T

Tar concentration, 208 Temperature

in oil and water, 216

air, 856 as function of time and angle, 571 boiling point, 386-387 constant, 329, 757 critical, 343, 388 dependence, 795 development within and outside particle, 540 dimensionless, 782-785 distribution, 754, 766 effect on rate expressions, 519, 732 exhaust, 630 function, 469, 749 gradients, 191 melting, 747 optimal for reactors, 327 rise, 760 solidification, 744

Thermal conductivity as function of molar volume, 523 one-component systems, 388 relationship, 524, 830 temperature dependence, 523

Thermal properties effect on heat transfer coefficient, 548 Thermodynamic(s)

analysis, 463 availability analysis, 265 basic, 214 constraints, 107 correlation, 82 efficiencies, 268 equilibrium, 482 microemulsions, 212 properties, 372 values, 100-102

Trickle beds gas-to-liquid mass transfer, 715 operating conditions, 713 Tube(s)
circular plastic, 303
construction test, 9-10, 435, 694
electrical connections, 11
flow, 165
flow patterns in vertical, 346-349
friction factor, 167
geometrical parameters, 695
mass transfer rate, 299
pitot, 304
position of objects, 300
pulse dispersion, 14
refractory, 855

V

Vapor condensable, 865 continuity, 92 moisture content, 867 momentum, 92 vapor-liquid separation, 777 volume, 93

Vapor préssure methanol, 469 molecule density, 314 Variables manipulated, 222, 978 Velocity avial 1038

Velocity
axial, 1038
calibration, 569
critical, 551-553, 556-557
distribution, 392, 637, 766
fluctuation, 555
measurement, 326
seriated unequal, 89-90
space, 952
turbulent flow in smooth pipe, 308

Venturi jet scrubber characteristics, 283 mass transfer coefficient, 284-285 removal efficiency, 283 schematic diagram, 283

Viscosity dimensional analysis techniques, 386 effect, 854 low shear, 852 solvent, 313 suspension relative, 311-312

W

Z

Wool drying, 631

Zeolite
adsorption, 510
diffusivity vs. loading, 512-513
kinetic data, 511

